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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/809,147	03/14/2001	Toshiaki Kato	SQR-P1	5354

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EXAMINER	
ALI, SYED J	

ART UNIT	PAPER NUMBER
2195	

DATE MAILED: 04/27/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/809,147	KATO, TOSHIAKI	
	Examiner	Art Unit	
	Syed J Ali	2195	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *21 March 2005*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-20* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-20* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *Mar. 24, 2005*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on February 23, 2005 has been entered.

2. This office action is in response to the amendment filed February 23, 2005. Claims 1-20 are presented for examination.

3. The text of those sections of Title 35, U.S. code not included in this office action can be found in a prior office action.

Claim Rejections - 35 USC § 103

4. **Claims 1-6 and 12-18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Shapiro et al. (USPN 5,257,363) (hereinafter Shapiro) in view of Boland et al. (USPN 5,826,079) (hereinafter Boland).**

5. As per claim 1, Shapiro teaches the invention as claimed, including a parallel processing method for performing processing tasks in parallel on a plurality of processors comprising:

(a) identifying at least one area of a large processing task directed to a plurality of computational processes that can be grouped together as a task space (col. 5 lines 15-21; col. 13 lines 60-66) not dependent on passing of control of processing from an external process in order to complete processing of the computational processes of the task space (col. 13 lines 66-67); and

(b) breaking down the task space into a plurality of self-contained task objects each of which can be executed in one computational step without requiring passing of control to or from another object (col. 6 lines 3-10), wherein each task object is defined with a computational step (col. 6 line 7) and at least one "data-waiting" slot for receipt of data requested from another task object to which the aforesaid task object passes a message for the requested data (col. 6 lines 8-10), and wherein once all the "data-waiting" slots of a task object are filled by the respective return messages, the task object can perform its defined computational step without waiting for any other input (col. 7 lines 9-11, 32-36, 42-44; col. 8 lines 24-29).

6. Boland teaches the invention as claimed, including:

(c) scheduling the defined task objects of said identified task space so that each task object ready for processing is processed by a next available "unoccupied" one of the plurality of processors, by the sequence of:

(i) placing a task object with an unfilled "data-waiting" slot in a "waiting" state in which it is not assigned to any processor (col. 1 lines 18-23);

(ii) changing the status of a task object to an "active" state when all of its defined "data-waiting" slots have been filled (col. 1 lines 23-26), wherein it is assigned to a next available processor in an "unoccupied" state, then placing that processor's status in an "occupied" state (col. 4 lines 26-34); and

(iii) changing the status of the task object to a "dead" state when the computational step to be performed for the task object by the assigned processor has been completed (col. 4 lines 38-45), and then changing the processor's status to an "unoccupied" state to be assigned to a next "active" task object (col. 4 lines 26-34).

7. The method of Shapiro is primarily concerned with providing a simple data flow model for complex systems (col. 1 lines 57-63). A Petri net representation is described that allows various tasks to be represented as nodes, while inputs and outputs are represented as edges (Fig. 2). Shapiro acknowledges that this type of data representation is beneficial to many types of applications, particularly those that are complex or computationally intensive. Shapiro is concerned with representation of the data model, not with how the nodes and edges actually are scheduled on processors. Thus, a need exists for a scheduling mechanism that allows the abstract ideas presented in Shapiro to be realized in an actual computing environment.

Boland discusses a similar data representation as that described in Shapiro, i.e. a process waiting for data from another process does not become runnable until that data has become available. Thus, Boland is particularly relevant in providing a scheduling mechanism that works with the data model of Shapiro. Once the required information has become available, Boland activates the process and assigns it to the next available processor. It would have been obvious

to one of ordinary skill in the art to use Boland's scheduling mechanism with the data model of Shapiro since it would provide a way of scheduling processes immediately once input slots have been filled while also insuring that available processors do not remain idle while there is work in the queues to be performed.

8. As per claim 2, Shapiro teaches the invention as claimed, including a parallel processing method according to claim 1, wherein a master task grouping is defined by a plurality of task spaces (col. 1 lines 37-40) each of which contains multiple task objects and does not require passing of control from an external source in order to complete computation for the respective task space (col. 13 lines 66-67).

9. As per claim 3, Boland teaches the invention as claimed, including a parallel processing method according to claim 2, wherein all task objects of the task spaces which are in an "active" state are placed in a processing queue and each is assigned in turn to a next available "unoccupied" processor (col. 4 lines 19-22).

10. As per claim 4, Boland teaches the invention as claimed, including a parallel processing method according to claim 3, wherein a master engine for the master task grouping maintains threads which track the processing of task objects in each of the task spaces (col. 1 lines 27-29).

11. As per claim 5, Shapiro teaches the invention as claimed, including a parallel processing method according to claim 4, wherein the master engine for the master task grouping maintains

an internal space address assigned to each respective task object (col. 5 lines 15-21; col. 13 lines 60-67).

12. As per claim 6, Shapiro teaches the invention as claimed, including a parallel processing method according to claim 5, wherein a task object in one master task grouping can exchange data with a task object in another master task grouping by providing its internal space address indexed to its master task grouping (col. 13 lines 60-67; col. 14 lines 16-21).

13. As per claims 12-17, Shapiro teaches the invention as claimed, including a software programming method for performing processing tasks in parallel on a plurality of processors comprising the method steps of claims 1-6, respectively (col. 26 line 25).

14. As per claim 18, Shapiro teaches the invention as claimed, including a software programming method according to claim 12, further comprising storing templates for different types of task engines, spaces, and objects in a library and utilizing the templates to generate software programming for a desired processing task (col. 1 lines 41-65).

15. **Claims 7-11 and 19-20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Shapiro in view of Boland in view of Hunt ("IDF: A Graphical Data Flow Programming Language for Image Processing and Computer Vision").**

16. As per claim 7, Hunt teaches the invention as claimed, including a parallel processing method according to claim 1, wherein an identified task in computer graphics rendering includes shading an image frame of a scene (pg. 360, § 4.2 - Comments).

17. It would have been obvious to one of ordinary skill in the art to add Hunt to the combination of Shapiro and Boland since the image processing algorithm described by Hunt is nearly identical to that of Shapiro. While Shapiro described the fundamentals of the Petri net data representation and its relevance to complex systems, Hunt provides a specific area of computing that suffers from computationally intensive tasks that are in great need of simplification.

18. As per claim 8, Hunt teaches the invention as claimed, including a parallel processing method according to claim 7, wherein the shading task includes a master task grouping of shading task spaces each of which performs shading of a pixel in the image frame (pg. 355, § 3.6 - Polymorphism; pg. 359, § 4 - Conclusions).

19. As per claims 9-11, Hunt teaches the invention as claimed, including shading of pixels (pg. 360, § 4.2 - Comments) and compositing the shading results for pixels (pg. 355, § 3.6 - Polymorphism).

20. Hunt does not specifically teach shading pixels based upon ray shooting from light sources in the scene, the data-waiting slots wait for the return of data characterizing light emitted from a light source in the scene, or that rendering includes functions for receiving scene data for a "world map", defining scene objects in each frame, defining the pixels of an object in the scene intersected by an eye ray of a viewer, or tiling together the shading results returned by each of the master shading task groupings for respective objects in the image frame. However, these are well known features of image processing, which is the intended use of the disclosed programming language (pg. 352, Abstract; pg. 359, § 4 - Conclusion). The main feature of IDF as discussed by Hunt is the process by which the data flow is represented, wherein an execution node fires once all of its inputs are present (pg. 356, § 3.7 - Data Driven Scheduling). The particular image processing tasks are not discussed at length, as it would have been obvious to one of ordinary skill in the art that image processing includes numerous types of tasks that are computationally intensive and in need of a means of simplifying the way they are represented.

21. As per claims 19-20, Shapiro teaches the invention as claimed, including a software programming method for performing processing tasks in parallel on a plurality of processors comprising the method steps of claims 7-8, respectively (col. 26 line 25).

Response to Arguments

22. **Applicant's arguments with respect to claims 1-20 have been considered but are moot in view of the new grounds of rejection.**

Conclusion

23. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Syed J Ali whose telephone number is (571) 272-3769. The examiner can normally be reached on Mon-Fri 8-5:30, 2nd Friday off.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Meng-Ai T An can be reached on (571) 272-3756. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Any inquiry of a general nature or relating to the status of this application should be directed to the TC 2100 Group receptionist: 571-272-2100.

Syed Ali
April 19, 2005

MAJID BANANKHAH
PRIMARY EXAMINER